

# (12) UK Patent Application (19) GB (11) 2 314 834 (13) A

(43) Date of A Publication 14.01.1998

(21) Application No 9713636.0

(22) Date of Filing 28.06.1997

(30) Priority Data

(31) 9613715

(32) 29.06.1996

(33) GB

(51) INT CL<sup>6</sup>

B41F 21/08

(52) UK CL (Edition P )

B8R RAR2 R533 R535 R711

B6C CBAF C102 C267

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(56) Documents Cited

GB 2092114 A US 3591169 A US 2756995 A

(58) Field of Search

UK CL (Edition O ) B6C CBAF , B8R RARC RAR2

INT CL<sup>6</sup> B41F 21/00 21/08 , B65H 9/00

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(54) Sheet registration

(57) Sheets are conveyed through a printing machine by grippers attached to an endless member, and accurately registered by means on the impression cylinder(s) moving the grippers relative to the member. The sheets are initially registered by striking a datum stop on a register drum prior to gripping.

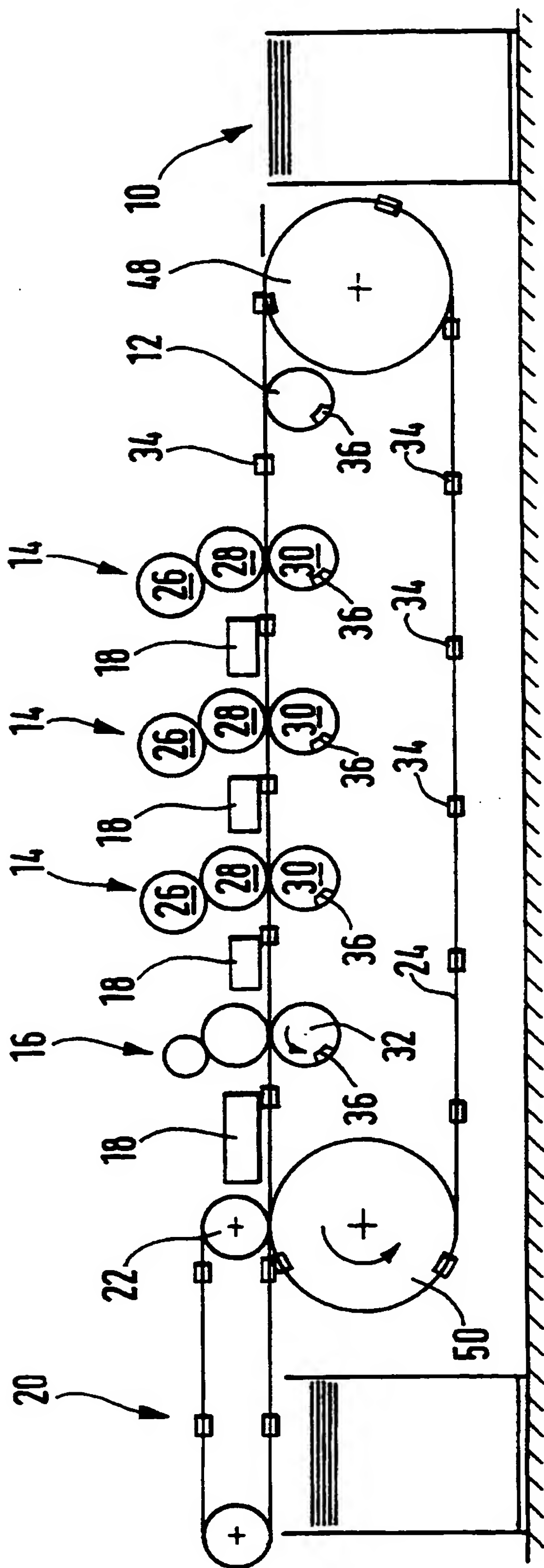


FIG.1.

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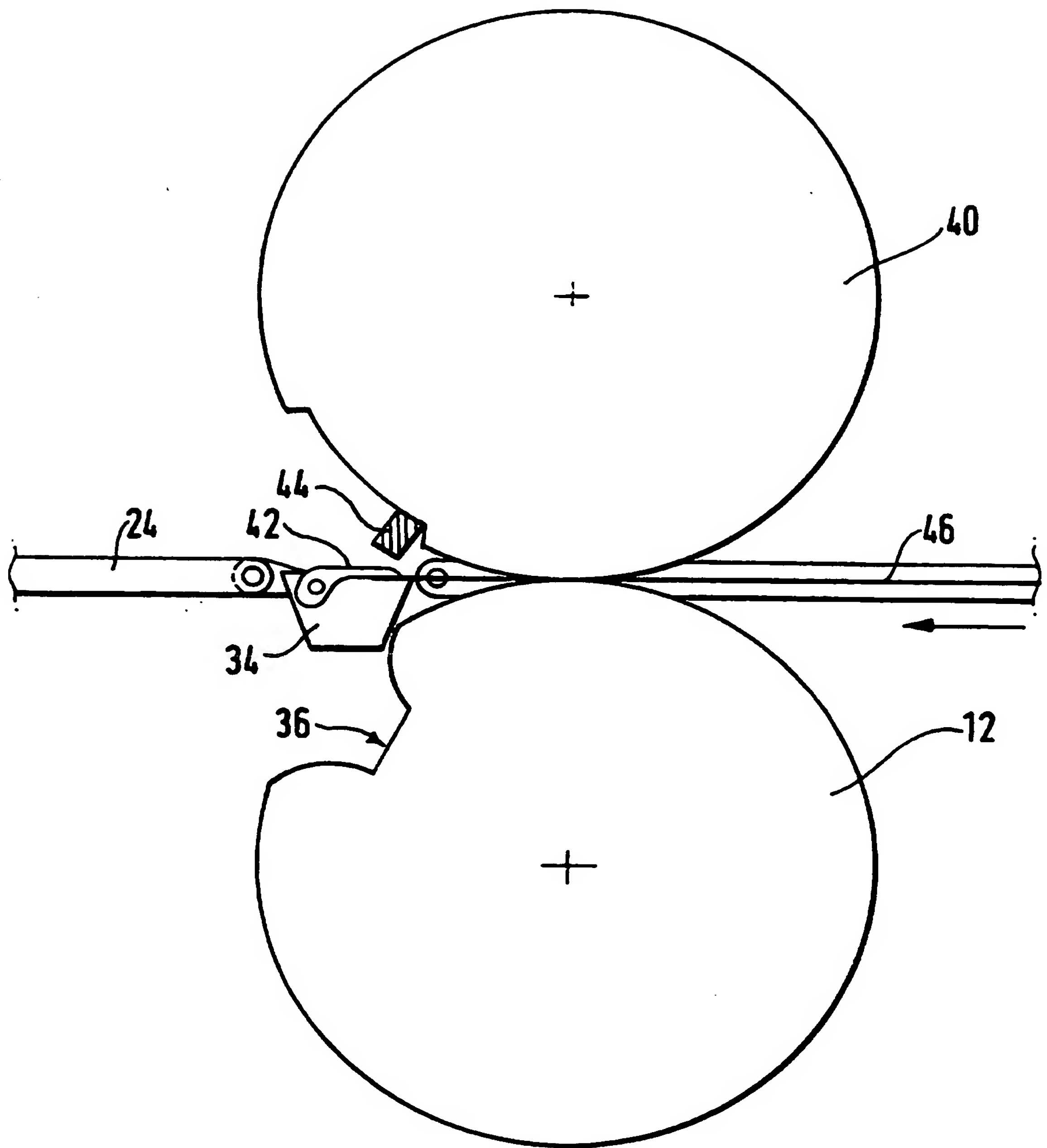


FIG.2.

(1)

"Sheet Printing Machine"

This invention relates to a machine for printing on individual sheets, and more particularly to the transference of the sheets through said machine.

5 In such a machine at least one press unit is employed, each such unit printing a different colour. A typical machine includes sheet feeding apparatus, between two and eight press units and a varnishing unit disposed in a line and sheet stacking apparatus. The sheets of the  
10 substrate to be printed are fed from the sheet feeding apparatus, transferred through the press units and the varnishing unit, and stacked at the sheet stacking apparatus. Drying means are usually provided after each press unit and after the varnishing unit. The press units  
15 can be of either the offset type, having a plate cylinder which carries a printing plate from which ink is transferred to a blanket cylinder between which and an impression cylinder there is a nip through which the sheets pass, or the flexographic type having a cylinder  
20 which carries a flexographic printing plate between which and an impression cylinder there is a nip through which the sheets pass.

The registration or accuracy with which each sheet is positioned at each of the press units is critical to the  
25 appearance and print quality of the finished sheet.

There are a number of known ways of transferring the

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sheets through the various units of such a machine, including a system employing a plurality of intermediate transfer drums and a system employing a plurality of intermediate transfer chains. Both of these systems  
5 utilise the common feature that the impression cylinder of each press unit is fitted with gripper means. These means are designed to take the leading edge of a sheet from the preceding transfer system, to grip said edge and lead the sheet through the nip, and finally to release the sheet to  
10 the next transfer system which leads it down-line to the next unit. In machines with these intermediate transfer systems each sheet is initially registered accurately in position against a datum stop. A transfer system then takes the sheet from its datum position to the first press  
15 unit. During this transfer and in each of the intermediate transfer systems it is important that the sheet does not move from its registered position, otherwise the successively printed colours will not be correctly positioned relative to one another. However, because the  
20 sheets are repeatedly regripped, it is difficult in practice to achieve a high degree of accuracy of the print, especially at high speed.

There is also a known sheet transfer system in which after infeed each sheet remains gripped by a mechanism  
25 which transfers it through the various units and releases it to sheet stacking apparatus. This mechanism usually

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comprises two endless flexible substantially inextensible members (which expression is hereinafter intended to include chains, belts and cables) disposed in parallel relationship one at each side of the line of units so as  
5 to traverse the full length of said line, although a single member or more than two members can be employed in narrow or broad machines respectively. Spaced along the members at a pitch equivalent to the circumference of the press cylinders are gripper means which are fixedly  
10 attached to the members so that their pitch is substantially invariable. The gripper means are guided by the members to travel substantially in a horizontal line at approximately the height of the nips. At the downstream end of the line the members pass around driving means  
15 which return the members and gripper means back underneath the impression cylinders of the press units to the sheet infeed end of the line. In this system each sheet is initially registered accurately in position against a datum stop as previously mentioned, and its leading edge  
20 is then gripped by the gripper means. Once so gripped, it remains gripped until the members have led it through all the various units. The driving means for the members are connected to the press units for synchronisation therewith. The periphery of each impression cylinder is  
25 simply recessed to allow the gripper means to pass through the nip. In this system the accuracy of the print relies

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on the accuracy of the gearing connecting the driving means to the press units, and also on the accuracy with which the gripper means are fixedly attached to the members. Thus, with this system also, it is not possible  
5 to achieve a high degree of accuracy of the print.

The object of the present invention is to enable a higher degree of accuracy of the print to be achieved at higher speed than hitherto with the flexible inextensible member system described previously.

10 According to the invention, a sheet printing machine comprises at least one press unit which includes an impression cylinder, at least one endless flexible member which traverses through the machine and to which sheet gripper means are so connected as to be capable of limited  
15 movement relative to the or each member, and means on the or each impression cylinder for accurately registering the gripper means relative to the cylinder or to each cylinder in turn.

The or each member is preferably driveably connected  
20 to the or each impression cylinder.

The sheets may be fed directly into registration with the gripper means.

Alternatively, the sheets are fed into registration with a register device and thence transferred to the  
25 gripper means.

Preferably, the register device is a register drum

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the periphery of which nominally touches the periphery of a cylinder between which and the drum the or each member passes.

Preferably, also, the register drum has a set of  
5 datum stops and is geared to rotate one revolution per sheet.

Preferably, the means for accurately registering the gripper means relative to the impression cylinder or to each impression cylinder in turn comprise interacting  
10 relatively adjustable contact surface means.

Two parallel members are preferably employed.

The invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, of which:-

15 Figure 1 is a side elevation of a sheet printing machine; and

Figure 2 is a side elevation on a larger scale of a modification to the sheet infeed end of the machine.

Referring now to Figure 1, a machine for printing on  
20 sheets of either metal or other substrates such as, for example, cardboard comprises sheet feeding apparatus 10, a register area support cylinder 12, a plurality of identical press units 14 of which three are shown, a varnishing unit 16, drying means 18 after each of said  
25 units, sheet stacking apparatus 20 including a cylinder 22 at its input end, and two parallel endless flexible



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members in the form of chains 24 which traverse through the machine from a cylinder 48 via the cylinder 12 to the cylinder 22 and a cylinder 50. Each of the press units 14 is of offset type and includes a plate cylinder 26, a  
5 blanket cylinder 28 and an impression cylinder 30. The varnishing unit 16 employs a similar arrangement of cylinders including an anvil cylinder 32. The chains 24 are driveably connected by gearing to each of the impression cylinders 30 for synchronisation therewith.  
10 Spaced along the chains 24 at a pitch equivalent to the circumference of the press cylinders 26, 28 and 30 are sheet gripper means in the form of gripper bars 34 which are so connected to the chains 24 as to be capable of limited movement, due for example to inbuilt compliance or  
15 clearance, relative to said chains. The cylinder 12, the impression cylinders 30 and the anvil cylinder 32 each have a recess 36 which allows the passage of the gripper bars 34. The gripper bars 34 are each fitted with datum stops for registering the front edges of respective  
20 sheets, while said bars and the impression cylinders 30 are fitted with interacting relatively adjustable contact surface means for enabling said bars to be accurately registered relative to each of said cylinders in turn quite independently of the accuracy of the chains 24 or  
25 other power transmission components of the machine. Due to the chains 24 being driveably connected to each of the

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impression cylinders 30 as aforesaid, the degree of relative movement required between the gripper bars 34 and the chains 24 is limited, and furthermore the upper horizontal run of the chains is not tensioned which  
5 reduces wear and risk of stretching especially in long machines. The sheets are fed directly into registration with the datum stops within the gripper bars 34 in the register area above the cylinders 12. Once gripped by a gripper bar 34, each sheet remains gripped by that bar  
10 until the chains 24 have led it through all the units 14 and 16 whereupon it is released to the sheet stacking apparatus 20.

Referring now to Figure 2, a modification of the sheet input end of the machine employs a rotary register  
15 device in the form of a register drum 40 the periphery of which nominally touches, that is to say rolls on, the periphery of the cylinder 12 between which and the drum 40 the chains 24 pass. The register drum 40 and the cylinder 12 are driveably connected by gearing so that said drum  
20 rotates one revolution per sheet. Of necessity, the cylinder 12 has a recess 36 as in Figure 1 to allow the passage of the gripper bars 34 which are connected to the chains 24 so as to be capable of limited movement relative thereto. A gripper 42 is shown hinged to the gripper bar  
25 34 illustrated in Figure 2. The register drum 40 is fitted with a set of datum stops 44 for registering the front

edges of successive sheets, and also with side stops (not shown) for locating the lateral edges of said sheets. The sheets, one of which is shown at 46, are first fed into registration with the datum stops 44 and then released to  
5 the gripper means 34, 42, remaining gripped thereby until the chains 24 have led them through all of the units 14 and 16. Thus separate datum stops are not required within each of the gripper bars 34, but it is still necessary for said bars and the impression cylinders 30 to be fitted  
10 with interacting relatively adjustable contact surface means for enabling said bars to be accurately registered relative to each of said cylinders in turn quite independently of the accuracy of the chains 24 or other power transmission components of the machine.

15 In other modifications, register devices which are linear or stationary in nature can be employed instead of the rotary register drum 40.

In a further modification, the press units are of flexographic instead of offset type.

20 In yet another modification one, or three or more, chains are employed.

In yet a further modification, belts or cables are employed instead of chains.

Due to each sheet being gripped only once at the  
25 infeed end of the machine and not released until printing and varnishing is completed and the sheet stacking

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apparatus 20 is reached, the chances of the sheet moving out of register with resultant print quality problems are minimised. Another advantage over a conventional printing machine is that the sheets are kept flat. The principal  
5 advantage of this invention, however, is enhanced accuracy of the print at higher speed.

Claims:-

1. A sheet printing machine comprising at least one press unit which includes an impression cylinder, at least one endless flexible member which traverses through the machine and to which sheet gripper means are so connected as to be capable of limited movement relative to the or each member, and means on the or each impression cylinder for accurately registering the gripper means relative to the cylinder or to each cylinder in turn.
2. A sheet printing machine according to claim 1, wherein the or each member is driveably connected to the or each impression cylinder.
3. A sheet printing machine according to either of the preceding claims, wherein the sheets are fed directly into registration with the gripper means.
4. A sheet printing machine according to claim 1 or claim 2, wherein the sheets are fed into registration with a register device and thence transferred to the gripper means.
5. A sheet printing machine according to claim 4, wherein the register device is a register drum the periphery of which nominally touches the periphery of a cylinder between which and the drum the or each member passes.
6. A sheet printing machine according to claim 4 or claim 5, wherein the register drum has a set of datum

stops and is geared to rotate one revolution per sheet.

7. A sheet printing machine according to any one of the preceding claims, wherein the means for accurately registering the gripper means relative to the impression  
5 cylinder or to each impression cylinder in turn comprise interacting relatively adjustable contact surface means.

8. A sheet printing machine according to any one of the preceding claims, wherein two parallel members are employed.

10 9. A sheet printing machine constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated by, Figure 1 of the accompanying drawings.

10. A sheet printing machine constructed, arranged and  
15 adapted to operate substantially as hereinbefore described with reference to, and as illustrated by, Figures 1 and 2 of the accompanying drawings.



# The Patent Office

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Application No: GB 9713636.0  
Claims searched: 1

Examiner: Howard Reeve  
Date of search: 7 August 1997

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B6C (CBAF); B8R (RAR2, RARC)

Int Cl (Ed.6): B41F 21/00, 21/08; B65H 9/00

Other:

### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2092114	(M.A.N-ROLAND DRUCKMASCHINEN AG), whole document	1 at least
X	US 3591169	(FRIEDRICH PREUSS), see particularly column 2 lines 58 - 65	1 at least
X	US 2756995	(WERNER KOCH), see particularly column 2 lines 65 - 70	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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